Care of the Neurological System

Seizure management
Rectal diazepam administration
Vagal nerve stimulation
Ventricular shunt

Seizure Management

Overview

A *seizure* is an event in which there is a temporary change in behavior resulting from a sudden, abnormal burst of electrical activity in the brain. If the electrical disturbance is limited to only one area of the brain, then the result is a partial seizure. For example, the student may experience confusion, loss of awareness, aimless movements, or uncontrolled body movements. If the electrical disturbance affects the entire brain, the result is a generalized seizure.

Epilepsy or a *seizure disorder* is a chronic condition that is characterized by recurrent seizures. Many students with epilepsy have more than one seizure type and may have other symptoms as well.

Some seizures may result from an acute medical illness (e.g., with a diabetic during a hypoglycemic episode) or an acute injury (e.g., head injury) and cease once the illness is treated. Some children may have one seizure without the cause ever being known.

Classification of Seizures

The following table summarizes the classification of seizures:

Generalized Seizures	Clinical Manifestations
Tonic-clonic seizures (grand mal seizures; affects the entire brain) Onset: any age	Before the seizure, the student may have an **aura** or warning that the seizure is about to begin. The eyes roll upward, the student loses consciousness, falls to the ground, and becomes rigid as muscles tighten (tonic phase). This is followed by jerking movements of the entire body as muscles undergo rhythmic tightening and relaxation (clonic phase). During this phase, the student may become incontinent of stool and urine as his/her muscles contract and relax. Breathing may be shallow or even stop briefly, but renews as jerking movements end. Generalized seizures usually last 1-2 minutes. After the tonic-clonic phase, movement slows and is followed by drowsiness or deep sleep that can last several hours (postictal state).
Absence seizures (petit mal seizures, "lapses," or "staring spells") Onset: age 4-15	These seizures are characterized by a brief loss of consciousness with minimal or no alteration in muscle tone and sometimes go unrecognized. The seizures can be mistaken for daydreaming or inattentiveness. Students may: • Simply stare blankly for 5-10 seconds • Drop objects because of loss of muscle tone • Have minor movements such as lip-smacking • Experience twitching or slight hand movements

Generalized Seizures	Clinical Manifestations
	The student will be unable to recall what happened during these brief periods of "blankness." If untreated, seizures may occur many times a day. Seizures can be precipitated by fatigue, stress, hypoglycemia, or hyperventilation.
Atonic seizures Onset: age 2-5	Manifested as a sudden, momentary loss of motor tone. The student may or may not lose consciousness. A mild atonic seizure may cause a sudden, brief head drop. During a more severe atonic seizure, the student may suddenly fall to the ground, lose consciousness briefly, and then get up as if nothing happened. If a student has frequent atonic seizures, a helmet is worn to prevent injury to the head or face.
Myoclonic seizures	Characterized by sudden, brief contractures of a muscle or group of muscles without loss of consciousness.

Partial Seizures	Clinical Manifestations
Simple Partial Seizures (focal seizures; affects just one part of the brain)	Manifestations are dependent on the area affected and tend to be localized. The student may, or may not, lose consciousness and may be aware of the seizure. For example, a student's eyes or eyes and head turn to one side and the arm on that side may be extended with the fingers clenched. The student may appear to be looking toward the closed fist. It is important for an eyewitness to give a clear description of the seizure, especially which body parts are initially involved, to aid in diagnosis and treatment. Also, noting the circumstances that precipitated the episode can help in treatment. Students may also experience a postictal stage after a partial seizure.
Complex Partial Seizures (psychomotor seizures) Onset: age 3-adolescence	The most common type of seizures. These seizures first begin with an aura. Most commonly, the aura is described as a strange feeling in the pit of his/her stomach that rises up to the throat. Often this sensation is accompanied by odd or unpleasant odors or tastes, auditory or visual hallucinations, or feelings of elation or strangeness. A student may cry or run for help. During this time, the student is often unaware of his/her environment and unable to respond to the environment. After the aura, the student may suddenly become limp or stiff, appear dazed, and confused and apathetic. The most obvious behaviors may be lip smacking, repeating words, chewing, drooling, swallowing, and nausea and abdominal

Partial Seizures	Clinical Manifestations
	pain followed by stiffness, a fall, and sleep. Partial seizures may spread and become generalized.

Potential Settings

Many students with a history of seizures attend a regular classroom and participate in regular school activities, with modifications that are determined by the parents, health care provider, school nurse, and school staff. As with all medical conditions, every effort is made to protect the student's privacy, especially during the occurrence of a seizure. School personnel having contact with the student are to be familiar with the student's medications and potential side effects, be able to recognize signs of seizure-related behavior, know what to do when signs are observed, and know how to implement the established school emergency plan.

Medications Currently Used to Treat Seizures (this list includes only a sample of medications available to treat seizures)

Generic Name	Trade Name	Seizure Type	Adverse Reactions
Carbamazepine	*Tegretol*	Secondary tonic/clonic Complex partial Simple partial	Allergic reactions, dizziness, ataxia, muscle incoordination, nausea, behavioral changes, blurred or double vision, aplastic anemia, hepatitis
Clonazepam	*Klonopin*	Absence Myoclonic Tonic/clonic	Sedation, hyperactivity, aggressiveness, slurred speech, double vision, behavior changes, increased salivation
Ethosuximide	*Zarontin*	Absence	GI upset, loss of appetite, headache, lethargy, behavior changes, dizziness, dystonia, myelosuppression, drug-induced lupus
Felbamate—used only with caution and informed consent due to serious adverse reactions	*Felbatol*	Partial, patients > 12 years	**Aplastic anemia, hepatic failure,** anorexia, weight loss, nausea, insomnia, headache, fatigue
Gabapentin	*Neurontin*	Partial, patients >12 years	Somnolence, dizziness, ataxia, fatigue
Lamotigine	*Lamictal*	Partial Tonic-clonic Absence Atonic	Somnolence, dizziness, rash, nausea

Generic Name	Trade Name	Seizure Type	Adverse Reactions
		Myoclonic	
Phenobarbital	*Luminal*	Tonic-clonic Partial Febrile	Sedation, hyperactivity, changes in sleep pattern, inattention, irritability, cognitive impairment
Phenytoin	*Dilantin*	Tonic-clonic Complex partial Simple partial	Gingival hyperplasia, hirsutism, nystagmus, blurred or double vision, ataxia, rashes, folate deficiency, drug-induced lupus, myelosuppression
Primidione	*Mysoline*	Tonic-clonic Complex partial Simple partial	Sedation, hyperactivity, ataxia, behavior changes, rare hematological and hypersensitivity reactions
Tigabine	*Gabatril*	Partial	Dizziness, somnolence, headache, depression
Topiramate	*Topamax*	Partial Tonic-clonic Atonic Myoclonic Absence	Somnolence, anorexia, fatigue, difficulty with concentration, nervousness
Valproate	*Depakote* *Depakene*	Myoclonic Absence Tonic-clonic Mixed seizures types	Hair loss, tremor, elevated liver enzymes and liver failure, irregular menses, increased appetite, nausea and vomiting, pancreatitis thrombocytopenia

Diet Therapy

In specific cases, students with seizures may be prescribed a ketogenic diet for treatment and control of seizures. Usually this diet is prescribed for students with poorly controlled seizures who cannot tolerate the side effects of anticonvulsants.

The ketogenic diet is designed to induce and maintain a state of ketosis which has been found to metabolically improve seizure control in certain cases. The diet is high in fat (80-90%) and low in carbohydrates and proteins. It is a carefully calculated diet and requires daily monitoring to maintain ketosis. A student on a ketogenic diet is followed by a registered dietitian and has a prescribed meal plan to follow daily. Coordination between the student's neurologist, dietitian, family, and school is recommended for the development of a successful individualized health care plan (IHCP). While a decrease in seizures as a result of a ketogenic diet have been documented, long term effects, such as increased blood lipids, are not known.

Monitoring

The purpose of seizure monitoring is to protect the student from injury during a seizure, to carefully observe the seizure in order to provide information for the management of the seizure disorder, and to distinguish between behaviors related to a seizure and those behaviors not related to it.

Monitoring provides the health care provider with the information needed to better manage the student's medication. An increase in the number of seizures may indicate that the student needs a change in medication or that he/she is not receiving the prescribed medication. A change in medication may be needed because of a change in the student's metabolism. In addition, antiepileptic medication can be toxic. Therefore, any side effects from the medication should be documented and reported to the school nurse, family, and/or health care provider. Careful monitoring of the student can improve the management of seizures.

Signs of an Emergency

A series of consecutive seizures in which the student does not regain consciousness is called *status epilepticus*, which is a medical emergency. Immediate medical care is required. Seizures that last longer than **5 minutes** require emergency medical services. Seizures lasting longer than 30 minutes can cause brain damage. Status epilepticus can lead to respiratory failure, brain damage, and death. Therefore, it is critical that the student receive immediate medical attention.

Managing a Seizure

Managing a seizure in school consists of protecting the student, observing the student, and getting medical assistance when needed. The procedures on the following pages are guidelines for managing a student having a seizure and what to do after the student has a seizure.

Components of the Individualized Health Care Plan

Each student's IHCP must be tailored to the individual's needs. The following section covers the procedure for managing a seizure and possible problems and emergencies that may arise. It is essential to review it before writing the IHCP.

A sample plan is included in Appendix A. For a student with seizures, the following items should receive particular attention:

- Student's underlying condition and possible problems associated with the condition or treatment.
- Type of seizures student experiences and typical course of seizure
- Student's baseline or normal behaviors.
- Whether student experiences auras, or can anticipate when seizures may occur
- Behaviors that indicate a seizure may be about to occur
- Actions to take if the student has a seizure
- Medications the student is taking and signs of adverse reactions or toxicity
- Determining the need for seizure precautions, and what these precautions will be

- Latex allergy alert
- Standard precautions

Sources:

Epilepsy Foundation of America. (2002). Managing Seizures at School. Available at https://www.efa.org/answerplace/teachers/managing.html. Accessed 09 May 2003.

Hockenberry, M.J. (2003). *Wong's Nursing Care of Infants and Children*. (7th ed.). St. Louis: Mosby, pp 1684-1698.

Procedure for Managing a Seizure

Note: Equipment and supplies provided by parents.

1. Prepare school environment to be as safe as possible for the student who has a history of seizures.
   Be aware of the potential for head injuries with uncontrolled seizures. The student may require a lightweight helmet for head protection, especially for seizures that produce sudden changes in muscle tone (atonic, myoclonic, akinetic). Prepare for potential problems associated with seizures. For example, if the student has copious secretions with a seizure, a bulb syringe or suction machine will need to be available.
   Pathways and environments should be free of unnecessary objects. For example, unused toys, wheelchairs, storage boxes, etc. should be removed from the environment.
   Supervision during use of hazardous machinery or equipment (such as that found in a shop class) should be available.

If the student has a seizure:

2. Remain calm.
   No one can stop a seizure once it starts.
3. Have an adult stay with the student during the seizure to monitor his/her progress.
4. Put on gloves, if available.
5. Place student on side or stomach. If possible, put something flat and soft (like a folded blanket or jacket) under student's head so the student cannot bang against the floor.
   This positioning prevents the tongue from blocking airway and helps the student not to choke on secretions.
6. **Do not place anything in the student's mouth**.
   *Padded tongue blades and airways were accepted practice, but now are **not** recommended because they may induce vomiting, cause potential damage to teeth, and potential aspiration.*
7. Loosen tight clothing, especially around the student's neck.
8. If student is standing or sitting, gently lower student to the ground to avoid a fall. Clear the area of anything that could hurt the student. **Do not attempt to restrain student** or use force.
   Even if the student is in a wheelchair /adaptive device, lower the student to the ground.
9. Do not give the student any oral medications or anything to drink during a seizure.
10. Document all the student's activity during the seizure: time the seizure began, area of body where the seizure began, any movement of the seizure from one area of the body to another, type of movements of the head, face, arms.
11. Call Emergency Medical Services if:
    - Child stops breathing.
    - There is evidence of an injury.
    - Child is diabetic or pregnant.
    - Seizure lasts more than 5 minutes.
    - Pupils are not equal after seizure.
    - Child cannot be awakened and is unresponsive to pain after seizure has ended.
    - Child vomits continuously 30 minutes after seizure has ended.
    - This is child's first seizure.

After a Student Has a Seizure:

1. After the seizure is over, clear secretions from the student's mouth with a bulb syringe or suction catheter. Keep child on his/her side.
   Do not try to clear the student's mouth until the seizure has ended.
2. Monitor student's breathing.
   Check position of head and tongue. Reposition if head is hyperextended. If student is not breathing, activate the school emergency plan and begin CPR.
3. Talk with student to determine student's level of awareness.
   Note if the student is alert, confused, drowsy, etc. and document findings.
4. Determine and document whether or not the student is able to move arms and legs, or if there is change in the student's ability to move.
5. Check for injuries and provide care, if needed. If student remains unconscious after seizure is over, maintain open airway and continue to assess breathing. If necessary, start Rescue Breathing or CPR.
6. Check for loss of control of urine and stool, and for any injuries. Provide privacy.
   Loss of control is very embarrassing to the student. Clean the student to make him/her more comfortable.
7. Make the student comfortable; allow him/her to sleep as needed. Do not give food or liquids until fully alert and swallowing reflex has returned.
   After the seizure, the student may sleep for 30 minutes up to a number of hours (postictal period).
8. Document the length of seizure, what happened during the seizure, and postictal period.
   Notify school nurse, family, and/or health care provider.

Sources:

Epilepsy Foundation of America. (2002). *Managing Seizures at School.* Available at https://www.efa.org/answerplace/teachers/managing.html.

Hockenberry, M.J. (2003). *Wong's Nursing Care of Infants and Children*. (7th ed.). St. Louis: Mosby, pp 1684-1698.

General Information for
Students Who May Have a Seizure

Date: _____

To: _____ (Teachers, Instructional assistants, Bus drivers, etc)

Name of Student: _____

This student has had seizures in the past. He or she may be taking medications to prevent a seizure from occurring again. A *seizure* is an event in which there is a temporary change in behavior resulting from a sudden, abnormal burst of electrical activity in the brain.

Most students who experience seizures are able to participate in regular school activities. Some students may be able to anticipate when they are getting ready to have a seizure. If a seizure is noted, or if the student tells you that a seizure is about to occur, remain calm and contact the school nurse, family, or designated contact person.

Seizures usually last less than 5 minutes. Call for help, but do not leave the student. Do **NOT** try to put anything in the student's mouth during a seizure. If student is standing or sitting, gently lower student to the ground to avoid a fall. Place student on side or stomach. Monitor the student's ability to breathe and remove hard objects that might accidentally be hit.

This student should have an Emergency Action Care Plan and **all staff** who have contact with this student should be familiar with how to initiate the plan. Any unusual behaviors or seizure activity should be reported to the school nurse and family.

Contact _____ at _____ (phone number/pager) for additional information or if the student experiences any problems with seizures.

Rectal Diazepam for Seizures

A *seizure disorder* or e*pilepsy* is a chronic condition that is characterized by recurrent seizures. A *seizure* is an event in which there is a temporary change in behavior resulting from a sudden, abnormal burst of electrical activity in the brain. Many students with epilepsy have more than one seizure type and may have other symptoms as well. Some students continue to experience seizures despite medical treatment. Acute prolonged or repetitive seizures are detrimental to a student's health.

Studies show that rectal diazepam can be a safe and effective treatment for acute repetitive or prolonged seizures. Although intravenous diazepam can produce serious respiratory depression, published studies of rectal diazepam have found no instances of serious respiratory depression. However, some anecdotal stories of respiratory depression exist. The most common side effect of rectal diazepam is sleepiness. Other side effects that have been reported include dizziness, headache, poor coordination, pain, nervousness, slowed speech, diarrhea, and rash. The greatest incidence of side effects is when more than one dose is given.

Rectal diazepam is available as a rectal gel or suppository. The most commonly prescribed form is Diastat®, a rectal gel that comes pre-packaged as a quick delivery set in a syringe with a flexible, molded tip. It can be stored for three years at room temperature.

Potential Settings

The need to give rectal diazepam can occur anywhere. Measures should be taken to protect the privacy of the student as much as possible. Students who may require rectal diazepam on the bus should have an adult aid available on the bus. Guidelines regarding where and how diazepam can be administered should be covered in the student's individualized health care plan.

Staff Preparation

Rectal diazepam can be administered by a registered school nurse, licensed practical nurse, or other adult with specialized training in appropriate techniques and problem management. Guidelines regarding who can administer rectal diazepam should be included in the student's individualized health care plan. These persons should also have training in cardiopulmonary resuscitation. Any school personnel who has regular contact with a student who requires rectal diazepam should receive general training covering the student's specific needs, potential problems and implementation of the established emergency plan.

Components of the Individualized Health Care Plan

Each student's IHCP must be tailored to the individual's needs. The following section covers the procedure for the administration of rectal diazepam and possible problems and emergencies that may arise. It is essential to review it before writing the IHCP.

A sample plan is included in Appendix A. For a student who requires rectal diazepam, the following items should receive particular attention:

- Details of events which would necessitate the administration of rectal diazepam
- Need to call 911 and activate the school emergency plan when rectal diazepam is given
- Student's underlying condition and possible problems associated with the condition or treatment.
- Type of seizures student experiences and typical course of seizure
- Actions to take when the student has a seizure
- Side effects to monitor
- What to do if respiratory depression is noted
- Student's baseline or normal behaviors.
- Whether student experiences auras, or can anticipate when seizures may occur
- Behaviors that indicate a seizure may be about to occur
- Other medications the student is taking and signs of adverse reactions or toxicity
- Latex allergy alert
- Standard precautions

Sources:

Dreifuss, FE, et al. (1998). A Comparison of Rectal Diazepam Gel and Placebo for Acute Repetitive Seizures. *The New England Journal of Medicine* 338 (26): 1869-1875.

Epilepsy.com. Reviewed by Schachter, SC. (2004). *Diastat*. Available online at: www.epilpsy.com.

Epilepsy Foundation of America. (No date). *Use of New Treatments in Schools, Daycare, and Camps*. Available online at www.epilepsyfoundation.org.

Hockenberry, M.J. (2003). *Wong's Nursing Care of Infants and Children*. (7th ed.). St. Louis: Mosby, 1692.

National Association of School Nurses. ((2003). *Position Statement: The role of the School Nurse Caring for a Student Requiring a Rectal Medication for Seizures.* Available online at www.nans.org/positions/rectalmeds.htm.

National Institute of Neurological Disorders and Strokes. (2001). *Safe and Effective Treatment for Acute Repetitive Seizures Available for At-Home Use*. Originally released June 1998. Available online at www.ninds.nih.gov

Procedure for Administering Rectal Diazepam

Note: Equipment, supplies, and medications provided by parents.

1. Review procedure prior to having to implement it.
2. Verify the medication order.
3. Don gloves.
4. Obtain assistance of another adult, if possible.
5. Remove protective cover from the medication syringe and lubricate the rectal tip with lubricating jelly (comes with syringe).
6. Turn the student on his or her side (left side preferable) facing you. Bend the upper leg forward and separate the buttocks to expose the rectum.
7. Gently insert the syringe tip into the rectum. The rim should be snug against the rectal opening. Slowly count to three while gently pushing in the plunger. Count to three again before removing the syringe. Hold the buttocks together while counting to three one more time.
8. Keep the student on their side facing you and note the time the medication was given.
9. **Call 911 and activate the emergency plan.**
   911 must be called and the emergency plan activated whenever rectal diazepam is given by school personnel.
10. Observe the student for side effects. Monitor respiratory status throughout the seizures and afterwards.
    Respiratory depression can be a consequence of a seizure and/or of seizure medications.
11. Remove gloves and wash hands when appropriate.
12. Document the administration of diazepam, student's response, and implementation of the emergency plan.

Sources:

Cerner Multum, Inc. (2004). Diastat. Available online at http://www.drugs.com/MTM/D/Diastat.html.

Dreifuss, FE, et al. (1998). A Comparison of Rectal Diazepam Gel and Placebo for Acute Repetitive Seizures. *The New England Journal of Medicine* 338 (26): 1869-1875.

Epilepsy.com. Reviewed by Schachter, SC. (2004). *Diastat*. Available online at: www.epilpsy.com.

Epilepsy Foundation of America. (No date). *Use of New Treatments in Schools, Daycare, and Camps*. Available online at www.epilepsyfoundation.org.

Hockenberry, M.J. (2003). *Wong's Nursing Care of Infants and Children*. (7th ed.). St. Louis: Mosby, 1692.

National Association of School Nurses. ((2003). *Position Statement: The role of the School Nurse Caring for a Student Requiring a Rectal Medication for Seizures.* Available online at www.nans.org/positions/rectalmeds.htm.

National Institute of Neurological Disorders and Strokes. (2001). *Safe and Effective Treatment for Acute Repetitive Seizures Available for At-Home Use*. Originally released June 1998. Available online at www.ninds.nih.gov

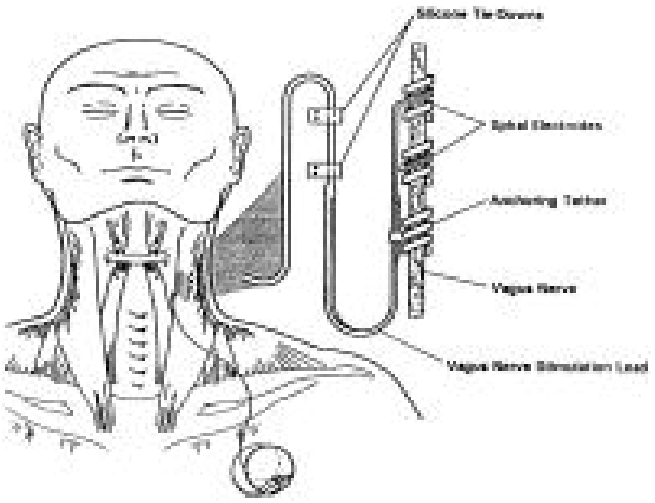
Vagal Nerve Stimulation for Seizures

A *seizure disorder* or e*pilepsy* is a chronic condition that is characterized by recurrent seizures. A *seizure* is an event in which there is a temporary change in behavior resulting from a sudden, abnormal burst of electrical activity in the brain. Many students with epilepsy have more than one seizure type and may have other symptoms as well. Some students continue to experience seizures despite medical treatment. Acute prolonged or repetitive seizures are detrimental to a student's health.

Vagal nerve stimulation (VNS) has been found to reduce the frequency and intensity of some seizures. It involves the insertion of a device similar to a pacemaker under the skin on the left side of the chest. This vagal nerve stimulator can send intermittent electrical signals to the brain by stimulating the left vagus nerve in the neck. The vagus nerve is one of the cranial nerves that controls the muscles responsible for swallowing, coughing and voice sounds. It is not fully understood how VNS works, but the theory is that the stimulation alters nerve pathways that lead to a seizure. Benefits of VNS are not always apparent immediately. Seizure activity may improve immediately, or it may improve over a two-year time period

The vagal nerve stimulator works in two ways. It is automatically programmed to deliver stimulation; typically the stimulator activates "on" for 30 seconds once every 5 minutes. It can also be activated to give extra stimulations manually between pre-programmed stimulations by placing a magnet over the stimulator and then removing the magnet.

The VNS system consists of a pulse generator which is battery-operated and looks much like a pacemaker implanted under the skin of the chest. Programming of the generator is accomplished with a wand attached to a computer. A strong magnet can also be used to activate the VNS on demand if the student senses that a seizure is about to occur or has just started. In addition, the magnet can temporarily suspend activity of the VNS if activation of the VNS affects normal eating, speaking, or singing.



The most common side effects of VNS are hoarseness and tingling or pain in the throat or neck. Cough, headache, and ear pain have also been reported. Side effects tend to diminish over time. Equipment that could interfere with the stimulator should be avoided. This includes strong magnets, MRI scanners, hair clippers, and loudspeaker magnets. Areas which display pacemaker warning signs should also be avoided. The additional handheld magnets supplied for manual stimulation of the system can damage credit cards, cell phones, and computer disks.

Potential Settings

The VNS system delivers stimulation on a regular, ongoing basis. The need for additional VNS to prevent a seizure can occur anywhere. Measures should be taken to protect the privacy of the student.

Staff Preparation

VNS can be administered by the student or by an adult with training in appropriate VNS techniques and problem management. Any school personnel who has regular contact with a student who requires VNS should receive general training covering the student's specific needs, potential problems and implementation of the established emergency plan. This training should include what to do when a seizure occurs and how and when to activate VNS.

Components of the Individualized Health Care Plan

Each student's IHCP must be tailored to the individual's needs. The following section covers the procedure for the vagal nerve stimulation and possible problems and emergencies that may arise. It is essential to review it before writing the IHCP.

A sample plan is included in Appendix A. For a student who requires vagal nerve stimulation, the following items should receive particular attention:

- Student's underlying condition and possible problems associated with the condition or treatment.
- Type of seizures student experiences and typical course of seizure
- Whether student experiences auras, or can anticipate when seizures are about to occur
- Behaviors that indicate a seizure may be about to occur
- Actions to take when the student has a seizure
- When and how to use VNS magnets
- Side effects to monitor
- Student's baseline or normal behaviors.
- Other medications the student is taking and signs of adverse reactions or toxicity
- Standard precautions

Sources:

Cyberonics, Inc. (2002). *Patient's Manual for Vagus Nerve Stimulation*. Houston, TX: Cyberonics, Inc.

Kennedy PA & Schallert G. (2001). Practical Issues and Concepts in Vagus Nerve Stimulation: A Nursing Review. *Journal of Neuroscience Nursing* 33(2): 105-112.

VNS Therapy. (No date; accessed 22 May 2004). Available online at www.vnstherapy.com

Zalvan, C et al. (2003). Laryngopharyngeal Dysfunction From the Implant Vagal Nerve Stimulator. *Laryngoscope* 113(2): 221-225.

Procedure for Activating Vagal Nerve Stimulation

Note: Equipment and supplies provided by parents.

1. Review literature that comes with the vagal nerve stimulator.
2. Student or trained caregiver should keep magnet with student at all times. The watch-style magnet attaches to the wrist with a wristband. The pager-style magnet comes with a belt clip so that the magnet and clip can be removed as a unit from the belt without coming apart. Always keep magnets at least 10 inches away from credit cards, televisions, computers, computer disks, microwave ovens, watches, or other magnets.
3. If student senses a seizure is about to occur, place the magnet over the Pulse Generator site for one second and then move it away. This will cause the VNS system to deliver extra stimulation. This can be done by the student or by any adult trained in using VNS. *To use the pager-style magnet, remove the belt clip and magnet from the belt and place the label against the Pulse Generator. To use the watch-style magnet, position the wrist so that the label can be placed over the generator.*
4. To temporarily stop stimulation (turn "off" the Pulse Generator) when student needs to sing or speak in public, while eating, or if stimulation is ever painful, put the magnet over the Pulse Generator and leave it there. The Pulse Generator will not stimulate while the magnet is in place over top of it, but it will start when the magnet is removed. The magnet should not be used for more than four hours in a row because it can decrease the Pulse Generator battery.
5. Check the pulse generator battery on a regular basis. Pass the magnet over the Pulse Generator for one second to see if it causes a stimulation and is working.
6. If stimulation ever hurts, hold the magnet in place to stop stimulation and contact school nurse and health care provider immediately.
7. If student complains, of sore throat, hoarseness, or any other problems with the VNS, document in student log and notify the school nurse and family.

Sources:

Cyberonics, Inc. (2002). *Patient's Manual for Vagus Nerve Stimulation*. Houston, TX: Cyberonics, Inc.

Kennedy PA & Schallert G. (2001). Practical Issues and Concepts in Vagus Nerve Stimulation: A Nursing Review. *Journal of Neuroscience Nursing* 33(2): 105-112.

VNS Therapy. (No date; accessed 22 May 2004). Available online at www.vnstherapy.com

Zalvan, C et al. (2003). Laryngopharyngeal Dysfunction From the Implant Vagal Nerve Stimulator. *Laryngoscope* 113(2): 221-225.

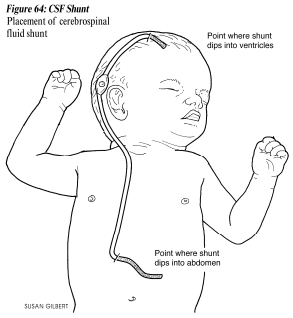
Illustration Source:

Cyberonics, Inc. (2002). *Patient's Manual for Vagus Nerve Stimulation*. Houston, TX: Cyberonics, Inc.

Ventricular Shunt

Overview

A ventricular shunt is a method of treatment for hydrocephalus, excess cerebrospinal fluid in the ventricles of the brain. A ventricular shunt is surgically placed to drain the excess fluid from the ventricles in the brain into another part of the body. The most common type is the ventriculoperitoneal shunt (VP-shunt), which drains fluid from the ventricles of the brain to the peritoneal (abdominal) cavity. A ventriculoatrial shunt (VA-shunt) drains the excess fluid to the right chamber of the heart, the right atrium.



Students who have a shunt need routine monitoring to ensure the proper functioning of the shunt. Shunts can become infected, obstructed, or kinked. If the shunt malfunctions, cerebrospinal fluid does not drain properly and the student with hydrocephalus can develop increased intracranial pressure and possible brain damage. Shunt malfunctions can be detected by a change in behavior, headache, and/or difficulties with coordination. Shunt monitoring involves watching for behaviors that may indicate the shunt is not functioning. The family is the best source of information with regards to what signs the student is most likely to exhibit when the shunt is not functioning properly. Any such signs should be reported to the school nurse, family, and/or health care provider immediately.

Potential Settings

Students with a shunt can attend a regular classroom. Many students with a shunt are able to participate in regular school activities, with modifications determined by the family, health care provider, school nurse, and school staff. Activities that may result in damage to the shunt, such as contact sports, may be restricted.

Staff Preparation

Monitoring of a ventricular shunt may be performed by the school nurse, teacher aide, or other staff person who has training in monitoring the shunt of the student. General training should cover the student's specific health care needs, signs of increased intracranial pressure, potential problems, and how to implement the established emergency plan.

The basic skills checklist in Appendix B can be used as a foundation for competency-based training in appropriate techniques. The checklist outlines specific procedures. Once the procedures have been mastered, the completed checklist serves as documentation of training.

Components of the Individualized Health Care Plan

Each student's IHCP must be tailored to the individual's needs. The following section covers the procedure for monitoring a ventricular shunt and possible problems and emergencies that may arise. It is essential to review it before writing the IHCP.

A sample plan is included in Appendix A. For a student who requires monitoring of a ventricular shunt, the following items should receive particular attention:

- Student's underlying condition and possible problems associated with the condition or treatment
- Student's baseline or normal behaviors
- Behaviors that indicate that there may be a malfunction of the shunt. The family can usually describe which behaviors are specifically indicative of shunt malfunction in their child
- Symptoms and behaviors which should be reported to the school nurse and family
- Medications the student is taking and signs of adverse reactions or toxicity
- Determination of the need for seizure precautions
- Latex allergy alert
- Standard precautions

Sources:

Hockenberry, M.J. (2003). *Wong's Nursing Care of Infants and Children*. (7th ed.). St. Louis: Mosby, pp 436-444.

Graff, J., Ault, M., Guess, D., Taylor, M., & Thompson, B. (1990). Monitoring a Shunt. In *Health Care for Students and Disabilities, An Illustrated Medical Guide for the Classroom*. Baltimore: Paul H. Brookes Publishing, pp. 159-169.

Illustration Source:

The Center for Pediatric Emergency Medicine (CPEM). Teaching resource for instructors in prehospital pediatrics. Illustrations by Susan Gilbert. Available at http://www.cpem.org/html/giflist.html

Procedure for Monitoring a Ventricular Shunt

1. Document weekly observations of the student's:
   - Behavior
   - Level of activity
   - Response to, and awareness of, the environment
   - Coordination

   Using knowledge of the student's usual behavior can help staff discriminate between usual and unusual behavior.
2. Obtain baseline measurements of student's vital signs, especially blood pressure and pulse rate.
3. Document any signs of shunt malfunction or signs of infection in the school health record or student's log. Alert school nurse and family of any changes or concerns.
   See next page for signs of shunt malfunction or infection.

Sources:

Hockenberry, M.J. (2003). *Wong's Nursing Care of Infants and Children*. (7th ed.). St. Louis: Mosby, pp 436-444.

Graff, J., Ault, M., Guess, D., Taylor, M., & Thompson, B. (1990). Monitoring a Shunt. In *Health Care for Students and Disabilities, An Illustrated Medical Guide for the Classroom*. Baltimore: Paul H. Brookes Publishing, pp. 159-169.

Possible Problems with Ventricular Shunts

Assessment	Intervention/Rationale
Signs of increased intracranial pressure: • Headache • Nausea • Vomiting • Double vision or blurred vision • Irritability or restlessness • Personality change • Lethargy or drowsiness • Inability to follow simple commands • Decreased orientation to time and place • Seizures (Note: In the student whose fontanel--soft spot—can still be felt, the soft spot becomes full.)	*When a shunt malfunctions, the fluid in the ventricles builds up, resulting in increased intracranial pressure (increased pressure in the brain). School personnel who are uncertain of their observations should consult with the school nurse and/or family to determine if the health care provider should be notified.* *It is **important** that the school staff learn what is normal behavior for the individual student and what behaviors indicate the presence of increased intracranial pressure. Seizures must be monitored by the school staff and treated appropriately. See section on Seizures in this manual.*
If the pressure continues to increase in the ventricles, the student's pupils (the dark area in the center of the eye) may become smaller and react very slowly to light. If the pressure continues to increase, the student may complain of increased headache and the student's pupils may enlarge and become fixed when exposed to light. The pulse may decrease, breathing may become irregular, and eventually, death may occur.	*The physician may determine that the valve of the shunt must be pumped to reduce intracranial pressure. **The risks involved with the pumping of the shunt are great**. If too much cerebrospinal fluid is removed, there is a resulting decrease in the amount of pressure in the brain. The ventricles may collapse inward, resulting in additional brain damage. **This procedure should never be done in a school setting by non-physician school staff.***
Signs of shunt infection: • Nausea • Vomiting • Headache • Lethargy • Fever • Feeding problems	*Any signs of shunt infection should be reported to the school nurse and/or family. A shunt infection requires administration of antibiotics. The shunt may need to be replaced if the infection is not treated successfully.*

Sources:

Hockenberry, M.J. (2003). *Wong's Nursing Care of Infants and Children*. (7th ed.). St. Louis: Mosby, pp 436-444.

Graff, J., Ault, M., Guess, D., Taylor, M., & Thompson, B. (1990). Monitoring a Shunt. In *Health Care for Students and Disabilities, An Illustrated Medical Guide for the Classroom*. Baltimore: Paul H. Brookes Publishing, pp. 159-169.

General Information for
Students with Ventricular Shunts

Date: _____

To: _____ (Teachers, Instructional assistants, Bus drivers, etc)

Name of Student: _____

This student has a ventricular shunt used to drain excess fluid from the brain. The shunt is under the skin and is not visible except for a slight bulge.

Most students with ventricular shunts are able to participate in regular school activities, but may need to avoid contact sports. Blows to the head should be avoided. If a blow to the head occurs, the school nurse and family should be notified and the student should be observed closely for any changes in behavior.

Any other changes in behavior should be reported to the school nurse and family.

Contact _____ at _____ (phone number/pager) for additional information or if the student experiences any problems with the ventricular shunt.